UNIVERSITY OF PENNSYLVANIA

TESTS AND NORMS FOR VOCATIONAL GUIDANCE AT THE FIFTEEN-YEAR-OLD PERFORMANCE LEVEL

(A COMPARATIVE STUDY OF THE PROFICIENCY OF SIX HUNDRED CHILDREN)

BY

REBECCA E. LEAMING

A THESIS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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TESTS AND NORMS FOR VOCATIONAL GUIDANCE AT THE FIFTEEN-YEAR-OLD PERFORMANCE LEVEL.

(A Comparative Study of the Proficiency of Six Hundred Children)

By Rebecca E. Leaming

In 1919 and 1920, the Junior Employment Bureau in Philadelphia, which is maintained by the White-Williams Foundation in co-operation with the Bureau of Compulsory Education, attempted to give psychological tests to children who were suspected of being abnormal. Neither the time nor the facilities for thorough testing were available then, but the need for a mental examination of all applicants, whether normal or abnormal, was made evident by this attempt. There were, however, no collections of tests of either general competency or specific abilities which could be briefly administered and yet yield a comprehensive enough picture of the child's abilities and disabilities to be of real value in placement work. There are very few tests for older boys and girls with such standards that when a test is given the results can be compared with other results to find out where an individual stands in relation to his group, or to other groups. The Binet-Simon Scale provided the only available standard and that is not very satisfactory at the fifteen-year-old level. Presumably this group of children between fourteen and sixteen years of age who applied to the Junior Employment Bureau for help in securing jobs were all normal children, and yet some of those who were tested gave I. Q.'s of less than 70. This, according to Terman,* indicates feeblemindedness. The attempt to test each child psychologically was abandoned by the Bureau until a collection of tests could be found which would be brief yet comprehensive.

Working in this same direction, the Psychological Clinic of the University of Pennsylvania has maintained for the last two years a clinic for investigating the competency of boys and girls at the fifteen-year-old level with a view to vocational guidance.

* Terman, L. M. The Measurement of Intelligence. Houghton, Mifflin Co., 1916, p. 81.

The most urgent need at the present time, in this work, is a standard of norms with each test, for each group tested and comparative standards for all groups of children encountered in vocational guidance work. My experience with the Junior Employment Bureau and my connection with the Vocational Guidance Clinic of the Department of Psychology prompted me to undertake the determination of some of these norms. The direct inspiration for the study was supplied by Dr. Lightner Witmer, under whose supervision and helpful criticism the investigation was conducted.

Vocational guidance is a term which, in recent years, has come into widespread use. It is a general term which includes many things. Primarily, it means a determination of the general ability level of the individual and of any specific abilities or defects which he may have, in an endeavor to place him in a position educationally and economically where he will be able to use his abilities to the best advantage to himself and society. This is closely allied and sometimes confused with Educational Guidance, which is clearly a phase of Vocational Guidance. Vocational diagnosis precedes educational as well as occupational guidance. In order to handle the vocational guidance problem successfully it is necessary to make an analysis of the individual's competency, but it is also important to have an analytic chart of the abilities required for every possible job. Dr. Viteles'* idea of the psychograph of an individual corresponding to the psychograph of some job is an ideal for vocational guidance, which in its complete realization is a long distance off.

The time for vocational guidance is as early as possible in the life of the individual child when an educational career may be planned which will take cognizance of particular abilities and defects. Vocational guidance, however, may be useful at any time of life, but for many reasons a crucial period is at the age of from fourteen to sixteen years. This may be designated as the fifteen-year-old level, but we must set no arbitrary limits. The fifteen-year-old level is the age of physical maturity. This level, is in general, the age of earliest maturity, but children at this level may include individuals ranging in age from twelve to eighteen or twenty years and perhaps even more widely.

There are other reasons for pointing to this age level as a crucial period. It represents the moment when a child begins to be considered a unit member of society. He must take some place in the world as an adult. The term "child" carries with it the idea of a

* Viteles, Morris S. Job Specifications and Diagnostic Tests of Job Competency Designed for the Auditing Division of a Street Railway Company—A Psychological Study in Industrial Guidance. The Psychological Clinic, 1922, Vol. xlv, Nos. 3–4, May-June, pp. 83–106.

need for support and direction. A "child" must have parents, foster-parents, a guardian of some sort. He is not an independent unit of society. He is merely an attachment to, or a responsibility of, some other unit such as a parent, guardian or institution. But at the fifteen-year-old level, the social standard for normality requires the child, if necessary, to get out into the world and prove himself capable of handling his own problems in such a way as to secure a minimum of success which involves paying his own way, at least in part, and keeping out of serious trouble with the other members of the community.

A criterion of social proficiency is the ability to earn a living, even though it be a poor one. Fifteen-year-old boys and girls may not be able to support themselves in ease and comfort, but they must be capable of offering for sale a service that is reasonably acceptable at some price.

If he does not begin, at the fifteen-year-old level, to contribute to the productive work of society, he ought to have demonstrated that he possesses enough ability to be worth his keep while he is being trained and educated for some particular field which his particular gifts seem to indicate. If, for example, he has a high degree of intelligence and intellect, commonly called "mental ability," they may justify further systematic education and preparation for a professional career. If he has a talent for business, he may be taught the "tricks of trade" before he is turned out into the world to carry on some of the industrial and commercial pursuits of society. A talent for art, for music, or literary creation may justify training him along these special lines. Mechanical ability may warrant our providing a manual high school training course, in order to fit him for this particular field. If the analysis of the individual's competency does not justify further educational development, the object of vocational guidance is to find for each individual applicant a productive field, pleasing to himself, in which he may be expected to develop maximum efficiency.

Mentally, as well as socially, the fifteen-year-old boy or girl may be considered an adult. In the Stanford Revision of the Binet-Simon Scale, Terman* considers sixteen years the mental age of the average adult. He says "native intelligence, in so far as it can be measured by tests now available, appears to improve but little after the age of fifteen or sixteen years."

The compulsory school laws of many states† require children to

* Terman, L. M. The Measurement of Intelligence. Houghton, Mifflin Co., 1916, p. 140.

† Child Labor, Compulsory School Attendance and Mothers' Pension Laws of the States in Brief. National Child Labor Committee, New York City, N. Y., 1919.

remain in school up to the age of fourteen, and aim to give him the proficiency of at least fifth grade (in many states, Pennsylvania for example, sixth grade proficiency is required). When they reach the age of fourteen, however, and have advanced beyond the fifth or sixth grade, the individual, for the first time, may decide what he will do next. He may drop out of school, get working papers and take his place in the world as a wage earner. He may go to high school, intending later to go to college or a professional school. He may prepare himself for some trade either through an apprenticeship or in a trade school. He may take up a business course requiring only a grammar school preparation. No matter what he decides to do or what he actually does, this is the time when a decisive action is made by somebody.

Before this period any vocational or educational guidance, except for the mentally defective, the physically handicapped or the unusually talented, has to be largely informational. It consists of a mere telling what fields of occupation exist and something of the requirements for each. Now comes the time when the guidance must take the form of action. It is therefore necessary that we know something about the differences in children at this age. We must know something of their physical development, their mental equipment, their competency, their efficiency. We must secure some psychological tests which differentiate abilities and we must define the fifteen-year-old level of competency and proficiency.

Some years ago, Dr. Ide* in connection with her work at the Psychological Clinic gave some indices of competency at the six-year-old level. At this level the individual's competency can first be satisfactorily determined. The criterion at this level is congenital competency. One of the items to be ascertained at this time is the child's educability. Dr. Ide† concludes that "children of five may be expected to pass the Witmer Formboard Test and that the memory span of five-year-old children is four digits."

The next important age level is the fifteen-year-old level and here the index to be determined is the minimum of proficiency acceptable of a unit member of the social group. The assumption is that if he has not this minimum of proficiency he is held out of society in some institution for defectives, offenders or dependents or is kept, as a dependent, under guardianship in his own home. This investigation seeks to determine what normal fifteen-year-old children are like and what they can do.

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* Ide, G. G. The Educability Level of Five-Year-Old Children. Psych. Clinic, 1920, 13, 146–172.

† Ide, G. G. The Educability Level. Psych. Clinic, 1919, 13, 179–195.

What do we expect of the normal child of fifteen? We ought to eliminate from consideration all children who are decidedly infantile, even if they are fifteen years old or older. There are many boys and girls, more boys than girls, who at fourteen still have the physical development and mental maturity of the pre-pubescent child. This does not indicate that they are permanently in a backward or dull group. Frequently physical growth is accelerated later on, and then they catch up to their group norm, and by eighteen or twenty have reached normal development.

Unfortunately children at the fifteen-year-old level do not constitute a single homogeneous group. It is impossible to get a large group at this level who will be *just children.* For this reason three groups were singled out and tested separately.

A year's experience in the Junior Employment Bureau had suggested that the children who applied there for help in securing jobs were the poorest group of working children. They may well be called the "job-hunting" children. They either could not get a job for themselves, could not hold a job once they secured it, or did not know where to look for a job. This group of presumably low grade working children was selected as the first group to be tested at the fifteen-year-old level. It was decided to test one hundred boys and one hundred girls. Many more boys than girls apply to the bureau for jobs and as the time for making this study has to be somewhat limited, one hundred and thirty boys and only seventy girls were tested.

The next problem was to find a group of higher grade working children. The state law requires that all children between fourteen and sixteen years of age must attend continuation school two half days a week while working. One hundred boys and one hundred girls in continuation school were tested as representatives of the better grade of working children. As these children were employed and were attending continuation school regularly the inference seems reasonable that they were regularly employed with some measure of satisfaction to themselves and their employers. These children are therefore called the "job-holding" children.

A previous study* has shown that a large percentage of the "job-hunting" children had left school to go to work because they were unsuccessful in school work. To find the relative proficiency of a group of children who are successful in school work it was decided to test one hundred boys and one hundred girls at the fifteen-year-old level who are attending high school.

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* Leaming, R. E. Children Applying for Working Certificates. Psych. Clinic, 1922, 14, 163–179.

These three groups seem likely to give us a fair survey of "the fifteen-year-old level" within the limits of normality. There are not likely to be any geniuses nor any feebleminded among the six hundred children selected at random within the three groups. We may conclude, therefore, that the six hundred children recruited for testing from the Junior Employment Bureau, the Continuation Schools, and the High Schools, give us a representative picture of the distribution of abilities actually existing among normal children at the fifteen-year-old level.

The Selection of Tests for the Fifteen-Year-Old Level.

When the attempt is made to select a group of tests to use with children of from fourteen to sixteen years it astonishes one to find how very few tests there are which are especially designed for this level or which are even *tests*, in a strict sense of the word, for children of these ages.

The battery selected for this investigation leaves much to be desired. It is possible, however, that they are the best of the existing tests for an individual or clinical examination limited in time and yet comprehensive enough to explore the various abilities of each child to be tested.

Some objective scale or graded standard is needed to use as a background against which the results of our other tests may be examined, checked, criticised and evaluated. The Binet-Simon Scale* is probably the best known, the most generally used and the best standardized of the scales; so the starred tests of the Terman Revision of this series were included for this purpose. This scale gives us a mental age or, in the Witmer terminology, a performance age level, and an intelligence quotient or, according to Witmer, an index of proficiency. Whatever may be said for or against the Binet Tests, they at least are the most widely used and the best standardized of all psychological tests, and for this reason serve as an excellent point of departure and provide a background for the other tests. We are enabled by this series of tests to decide whether our subject can give the performance which is the assumed standard for his age level. We can, furthermore, decide how far short of this requirement he falls or how much more than the required amount he can produce. Although the Binet Tests appear to be tests of intellect rather than of intelligence, although they depend largely on language ability, and although the better the environment the better the chance for a high score, as Terman† himself admits; still, they provide a very

* Terman, L. M. The Measurement of Intelligence. The Stanford Revision and Extension of the Binet-Simon Intelligence Scale. Houghton, Mifflin Co., 1916.

†Terman, L. M. Measurement of Intelligence. p. 95.

handy scale for measuring the proficiency of the individual. So there is something to be said in favor of using the Binet Scale as a part, at least, of the psychological examination of these groups when we are called upon to test them for vocational guidance. There is one side of the Binet which has not been very widely discussed but which is important. There is a great difference in the quality of the responses on these tests, even when the quantitative results remain the same. This test enables the examiner to make estimates on some of the important items of the analytic diagnosis which the performance tests do not. For example, on the Binet the examiner may observe and rate complexity, alertness, understanding, observation and intellect. A satisfactory analytic diagnosis can be made by observing the child's reactions on the Binet Scale, although some of the items can be rated with much greater accuracy than others.*

The Witmer Cylinders† are somewhat more difficult than most formboard and puzzle tests, although they are below the level of this group so far as testing intelligence is concerned. This test, however, is an excellent means of observing and judging the performance of the individual from the qualitative side. His control, co-ordination, rate, attention, imageability, planfulness, observation and efficiency can be well rated by observing the performance on this test. As an intelligence test for this level it does not entirely fill the requirements. The problem involved is too easily solved by most children at this age. This fact is not surprising, as the test is considered at its best at the six-year-old level. It may be interesting to note, however, that in spite of this fact there was one failure with the cylinders among the boys and one among the girls of the "job-hunting" group; that is to say, they failed to solve the problem and complete the test within the time limit of five minutes.

Two performance tests of the formboard or puzzle type should be included in a collection of tests so that one may be used as a check against the other. The element of chance or accident may affect the results of one performance test, but if two are given the results obtained can be compared one with the other and a much safer conclusion can be reached as to the child's ability with that type of test.

The Dearborn Formboard 1C,‡ unlike the cylinders, seems to provide a real intelligence test for this level. The problem here is complex enough to make the child exercise his intelligence before he

* See Humpstone, H. J., The Analytical Diagnosis, Psych. Clinic, 1919, 12, 171–173, for the meaning of the analytic diagnosis.

† Paschal, F. C. The Witmer Cylinder Test. Hershey Press, Hershey, Pa., 1918.

‡ W. F. Dearborn, J. E. Anderson, A. O. Christiansen. Formboard and Construction Tests of Mental Ability. Jour. of Educ. Psych., 1916, 7, 448.

can solve it. The way in which the children attack the problem and work at it indicates that they are thinking it out. As one examiner remarked, "Let me make my analytic diagnosis on the Dearborn Formboard. You can fairly see the wheels going around in the child's head while he is solving it." The test gives the examiner an insight into the way the child sets about solving new problems. It is probably the best variety of formboard test for children of this level. This test, therefore, plays a double rôle in the examination of children from fourteen to sixteen years—it provides a real intelligence test of the performance type and it furnishes an opportunity for the examiner to observe and analyze the performance of the child under laboratory conditions. It is a valuable test to have in a collection to be used for the purpose of vocational guidance. Unfortunately, up to the time of my investigation there existed no real standardization of either the procedure or the results. The procedure used in this testing was that used by Dr. H. J. Humpstone. The four long blocks are removed and the blocks remaining in the board are arranged to give four short holes. The time limit set for solution is ten minutes.

Memory span seems to be one of the foundations of intellectual development, whether through education or training. The visual and auditory memory span was included in the collection of tests. It appears to measure the number of discrete units over which the individual can successfully distribute his attention and still organize them into a working unit. It cannot be omitted from any battery of tests which aims to be at all comprehensive. It figures in the Binet-Simon tests at practically every age level, but the digit series as provided in the Terman Revision of this test are not as satisfactory as the Humpstone* arrangement. There are places where the digits follow in sequence, make combinations or provide other tricks which help the child to get more than his true span would permit. For example, in the fourteen-year-old tests we find this combination 2 1 8 *3 4 3 9* and the second one is *9 7 2 8 4 7* 5. There are a number of associations that can be set up in either of these series which pad the true memory span. For this reason, Humpstone's arrangement of digits is the best to use in calculating the true memory span, because these series have been worked over and over in an attempt to rule out all sequences and combinations. Both visual and auditory memory span should be given, largely for the purpose of noting any marked difference in the individual's ability to do one better than the other. Defects in one of the types

* Humpstone, H. J. Some Aspects of the Memory Span. A Study in Associability. Psychological Clinic Press, Philadelphia, Pa., 1917.

of imagery can frequently be picked out for further testing in this way. As a rule the visual is one digit or more greater than the auditory. The Stanford Revision of the Binet-Simon Scale demands a memory span of seven from the fourteen-year-old child and eight from the superior adult.

Binet claims that "the ability to comprehend and act upon uniform directions without further explanation or demonstration forms a most important element in the complex mental processes." In order to test this important ability to follow directions the Woodworth and Wells Hard Directions Test* was included in this group of tests. The test seems to have some value but the scores do not distribute widely enough. By following the most obvious and least tricky directions the subject will make a score of 12 or 13. It is difficult, however, to make a score of 17 to 20. It requires alertness, intelligence and accuracy to make a high score.

In addition to the results of the purely psychological examination, we need a measure of school proficiency. Those who have worked with school children know quite well that a child who has completed a certain grade may not have the proficiency supposed to be required to complete the grade. There should be, therefore, at our command some quick means of estimating his school proficiency, at least in the fundamental three R's. The Courtis tests, while very helpful and satisfactory when there is plenty of time for an examination, are too long to give as part of a brief examination. The first two problems in each operation in arithmetic from a shortened Courtis Scale† were given in the testing of this group, but no attempt was made to discover in which operations the child was proficient or not proficient. It was purely a test of his ability to handle the four fundamental operations in arithmetic accurately and with a reasonable speed. This was not an entirely satisfactory procedure and some better method might easily be devised to test proficiency in arithmetic.

The Monroe Silent Reading Test‡ for 6th, 7th and 8th grades, while a good test for silent reading, leaves much to be desired when the aim is merely to test the proficiency in reading. What we really want to know is the degree of facility with which the child makes use of reading, writing and arithmetic as tools. We want to know how thoroughly he is trained in these necessary operations and how

* R. S. Woodworth and F. L. Wells. Association Tests. Monograph Supplement of the Psychological Review. 1911, p. 68. No. 57.

† Courtis Standard Tests—Arithmetic Special Edition, Univ. of Pa.—School of Education—Bureau of Educational Measurement, Research Tests in Arithmetic.

‡ Univ. of Pa.—School of Education—Bureau of Educational Measurements Standardized Silent Reading Test, Devised by Walter S. Monroe. Test 11 for grades 6, 7 and 8.

completely he has them at his command. When we are aiming to test the child's reading from this point of view the Monroe Test recommends itself only because there is no better.

Mrs. Wooley* includes in her "new scale of measurements for adolescents" at the fourteen, fifteen and sixteen-year levels a cancellation test, memory span 7, 8 and 9 digits, a substitution test, a language completion test and an "association by opposites" test. Healy and Fernald Construction puzzle tests A and B she places at the fourteen-year level; Healy and Fernald Problem Box at the fifteen and sixteen-year level, and the "Flower Pot" and "Egg" construction puzzles at the sixteen-year level. Woodworth and Wells Hard Directions Test she places at the eighteen-year level. Here also she places the Yerkes Point Scale, as a part of her collection tests. Tests such as the cancellation, the substitution and the language completion tests were omitted from this collection not only because of the limited time the child was at our disposal, but also because of our interest in the analytic side of our diagnosis. Preference was given to tests calling for performances that could be observed and noted, such as the formboard puzzle tests and the oral responses to the Binet tests.

With tests which are entirely written, the final judgment has to be of necessity primarily quantitative—how much has the child done, how long did it take him, or how much did he get correct? It is difficult to makes a qualitative analysis of his performance. Both kinds of test have a place in the examination of children. The time available for testing and the purpose of the examination will determine what tests shall be given. There are many more written tests of the cancellation, substitution and language completion type available for the examination of children of these ages than there are tests which call for an overt performance which may be carefully analyzed and studied. A great assortment of construction puzzles of the formboard type are needed which will provide *real problems* for testing the intelligence of normal fifteen-year-old children and adults.

As Mrs. Wooley states in the discussion of her scale, "No one test yields a satisfactory measure of ability, a group of tests probably does give a significant result." There is no one test which can be quickly applied to measure the ability of these children as they come up for consideration in vocational and educational guidance. We must use a series or groups of tests, but we cannot make out a list of tests which will consume, in their administration, so much

* Wooley, Helen T. A New Scale of Measurements for Adolescents. Jour. of Ed. Psych., 1915, 6, 521-550.

time per child that the value of the result is completely overshadowed by the time consumed in the examination. On the other hand, we can not cut out our tests down to such a minimum that the series is inadequate in comprehension. If we do we cannot expect to obtain from the examination a convincing picture of the mental level, the specific assets and defects of the particular child.

The tests finally chosen for this investigation are: *On the physical side*—Height, weight, an estimate of maturity, an estimate of general health, a notation of specific defects: *on the mental side*—two construction puzzle or formboard tests, a starred or shortened form of the Binet-Simon Tests, memory span, tests of school proficiency in reading, writing and arithmetic and the Woodworth and Wells Hard Directions Test. This seems to be about the minimum to which a series of tests can be reduced and still be comprehensive enough to be of real value in giving us a clinical picture of each child coming up for vocational guidance. A convenient blank for recording the results of individual examinations was provided. How the child does a test is, if anything, more important for a diagnosis of competency than a score in terms of speed or accuracy. Each examiner, therefore, filled out a Witmer Analytic Diagnostic Chart* for each child. This chart offers a survey of twenty-four items, as for example, Endurance, Control, Alertness, Trainability and so forth. A rating on the five point scale was given under each item: 1, very deficient; 2, deficient; 3, average; 4, superior; 5, very superior.

At the end of the day when all the tests were scored a composite analytic diagnosis was made for each child by combining the three which had been made independently by three different examiners upon the observation of the child's performance with the Witmer Cylinders, the Dearborn Formboard or the Binet Scale. Naturally there were few 1's or 5's. The usual ratings were 2, 3, or 4. The majority rating on each item was taken for the final sheet, i. e., if there were two 3's and a 2 a rating of 3 was given. If all disagreed the average was taken. Later on, these final analytical diagnoses were combined and a composite diagnosis sheet for each of the three groups was made. The results of this analytical study will be reported some time in the future.

Procedure.

There are many objections to having different examiners test the children in a group, especially when individual clinical examinations are given. It is impossible, however, for one person to give

* Humpstone, H. J. The Analytic Diagnosis. Psychological Clinic, 1919, 12, 171–173.
Witmer, Lightner. Performance and Success. Psychological Clinic, 1919, 12, 145–170.

600 individual clinical examinations in a comparatively short space of time, so that several examiners had to be used for the testing of this group. I was present at all examinations, however, and made all health and maturity judgments in order to keep them as uniform as possible.

The assistants included three members of the staff of the Psychological Clinic: Miss Mary E. Gallagher, the clinic recorder; Miss Charlotte Easby, the clinic teacher; Miss Margaret Brooke, the assistant social worker; and two graduate students in the department of psychology, Miss Alice M. Jones and Mrs. Helen W. Brown. Two seniors in the department also gave some assistance, Miss Margaret Frankeberger and Miss Belle Hitchner.

Five boys or five girls were sent at one time into the testing room. One examiner took a child and started immediately to give the Binet examination, making out an analytic diagnosis sheet after the examination was over. A second examiner started one child on one of the written tests (reading, arithmetic or directions) and then gave the Witmer cylinders to another, making out the analytic diagnosis sheet on this second child while he was doing the cylinders. The third examiner started a child on one of the written tests and gave a second child the Dearborn Formboard, during which performance he filled out an analytic blank. As the children completed each test they were moved around from one examiner to the next until the whole group had finished all of the tests. Usually the five children finished at the same time and another group of five would be sent through. It was found most efficient to have three examiners work at the same time. Five cases were examined per hour. When the Binet Test, which took the greatest amount of time, was too long and held up the group, one of the other testers would give the vocabulary, the fables, the arithmetic problems and the forward and backward memory span, leaving just enough of the tests to be given by the Binet examiner to enable her to make out her analytic diagnosis chart with some degree of accuracy.

Results.

In presenting the results obtained on the various tests with this group of six hundred children, it has seemed best to differ somewhat from the usual procedure of presenting elaborate tables.* Five measures only will be presented for the boys and girls of each group of children on each test. These are the maximum, the minimum,

* Complete tables containing the distribution of results and the usual statistical measures for each test are on file in the Laboratory of Psychology, and these results may be consulted at any time. The tables are being perfected through the addition of new measurements, as the results of examinations in progress are reported to the Director of the Psychological Clinic.

the twenty per cent mark, the median, or fifty per cent mark, and the eighty per cent mark—in other words, a quintile distribution. The maximum and minimum are not in every case the very lowest or the very highest measure or score which was made by any individual in that group. This quintile distribution of results on a given test represents what may be called the "norm" of performance, for a child of the fifteen-year-old level in the group of which he is a member. The determination of these norms is based on the assumption that as long as an individual maintains his place as a member of a group, he may be looked upon as a normal unit member of that group; for example, any child who is in high school, doing satisfactory high school work, must be considered a normal member of the high school group, and all of the results which these children may give—no matter what the range of variation—must be considered normal results. Since this distribution must be looked upon as the range of scores within which any measure must be considered normal for a fifteen-year-old child, we must be sure that our maximum and minimum are true results. The assumption on which this investigation is based is that all of the six hundred children tested were or normal mentality—therefore, any results made by these children are presumably normal results for this age level. The results seem to substantiate this presumption. It is possible, however, for a maximum or a minimum score to be an inaccurate score. This may be due to an error on the part of an examiner, although every effort was made to eliminate errors of this sort. It may be due to some condition whereby the individual test was not able to give a true measure of ability, or it may be that the individual, in spite of our assumption, should not be classed as a normal member of his group. It seemed justifiable, therefore, to inspect the rank order distribution of results, and if a maximum or a minimum measure seems to be out of range with the other values, to discard such scores as "not true values." The following tables were prepared in this way: Out of the 9600 values calculated, with the 600 children, 18 were discarded as inaccurate or "not true." This small number of cases discarded affects the results very little, and it seems to give a more accurate, certainly a more consistent, range of distribution for normal results of a given group than would otherwise be obtained.

There is some possibility, of course, that the minimum and maximum measures which have been discarded are true measures and that the addition of a much greater number of cases might fill in the gap between these measures and the next higher scores which have been taken as the actual minimums or maximums. For the present, however, it seems justifiable to accept the measures picked

out by the inspection of results when there is some doubt as to the validity of a maximum or minimum. All measures are preserved in permanent tables which, with the results of further investigations, will be published at some future time. The tables are prepared for clinical use and are therefore arranged in a manner which seemed convenient for quick reference.

Discussion.

Binet Tests.

As a part of a clinical examination the Binet-Simon Scale is a valuable test. As a complete psychological examination it is almost valueless, and to diagnose a child as superior, normal, borderline or feebleminded on the basis of the Binet I. Q. alone is little short of criminal.

Many objections can be raised to the Binet Test, but as all of these have much more weight when the test is used alone for diagnosis, I hope in a subsequent paper to discuss these objections at some length. For the present, I shall consider it as one test in a battery selected for making clinical diagnoses.

The I. Q. is easily affected by external factors. It is a fair measure of a child's language proficiency, the product of his environment as well as of his congenital ability. It also serves to indicate his home training, the general social level of his group and his own intellectual level (knowledge organized and usable). It is, however, a very poor measure of his "intelligence" in the much used sense of general performance level. Many of the tests in the scale depend upon the understanding of the English language in its finer shades of use and meaning. Some of the tests favor the child with a natural ability to use oral language as a tool. Too little attention is paid to performance tests which indicate mechanical skill or intelligence in the sense of an ability to solve a new problem. Home training shows up very clearly in the questions of comprehension, "what is the thing to do," "what ought you to say" and the like.

One of the most surprising discoveries is the very low range of the Binet Intelligence Quotients. The starred tests were used, but before this study was started complete Binet Scales were given to a number of subjects and then the I. Q. was reckoned, first on the basis of the complete examination and then on the basis of the starred tests. It was found that in most cases there was no difference and in all cases where there was a disagreement the difference was negligible.

Terman defines feeblemindedness as anything under an I. Q. of 70 and says that an I. Q. of 70 to 80 indicates "borderline deficiency,

sometimes classifiable as dullness, often as feeblemindedness" and that 80 to 90 indicates "dullness, rarely classifiable as feebleminded-ness." All of the six hundred children tested were normal and yet technically one hundred and thirteen cases out of the four hundred making up the working groups should be diagnosed as feebleminded-ness or borderline deficiency and forty-eight of these children should be called definitely feebleminded. Two high school boys gave I. Q.'s of 82 and seven girls gave I. Q.'s under 90, three of them scoring less than 80. The lower limit of mental normality falls far below the I. Q. usually accepted.

If a child has made a high Binet Score it is impossible to predict what he will be able to do with the performance tests. He may do very well, he may be mediocre or he may fail miserably. The chances seem to favor his making good scores on the Directions Test, the Monroe Reading, and the Arithmetic. Even this prediction, how-ever, is not always safe.

The Binet does give a good clinical picture of the child's intellect, language ability and social orientation, and for this reason, it was valuable as one of the tests used in making the diagnosis.

Memory Span.

The memory span results show that the mode for each group on the auditory digit memory span is 7 or 8. The mode for the visual digit memory span is the same. The mode for the two high school groups is 8, while in the other groups the mode is sometimes 7 and sometimes 8. There are only two cases of an auditory digit memory span of four and two where the visual digit memory span is 4. As these are only two cases out of six hundred, as the indi-viduals with the auditory span of 4 are not those with the visual span of 4, and as the individuals who gave 4 were in every case satisfactory on all other tests, it seemed fair to conclude that these results were accidental and not true measures of the memory span. For some reason, it was assumed, the child's true memory span was not obtained and these four cases were eliminated from the deter-mination of norms.

An auditory and visual digit memory span of at least 5 at the fifteen-year-old level is necessary to maintain a place as a normal member of society. There may be exceptions* to this in cases where the visual or auditory imagery is defective and in consequence the true operating memory span cannot be accurately obtained. In these cases the span can usually be tested out in some other way, by tapping tests, for example.

*Starr, Anna Spiesman. Article on memory span to appear in a coming number of the "Clinic".

No high school boy and only one high school girl failed to give an auditory digit memory span of more than 5. From this we may assume, until further investigation and the amassing of greater numbers of results prove otherwise, that a memory span of 6 is necessary for successful high school work. In fact, there were only three boys and four girls in the high school group who failed to give a memory span of more than 6.

A memory span of more than 7 or 8 does not seem to have diagnostic significance. Large scores may be due to special facility in using language, to echolalia, to the grouping of the digits or unusually good visual or auditory imagery. On the other hand, a span of less than 5 may be looked upon with suspicion. A span of three or less indicates mental inferiority certainly and feebleminded-ness probably.

A brief discussion seems in place here regarding the reverse memory span which is given at the nine, twelve and sixteen year levels of the Binet Scale. (This test will be discussed at greater length in a paper on the Terman Revision of the Binet-Simon Scale which is now in preparation.) This test shows some very peculiar characteristics and I very much question its value as a diagnostic measure. The ability to produce a long reverse memory span, 6 or 7 digits or more, seems to be a specific ability which has little relation to the mental level at which the individual functions. It is diagnostically significant when an individual of this age group cannot give a reverse span of 4 or even 5. The individual at the fifteen-year-old level may or may not give 6, however, depending on whether the particular child tested possesses the specific ability for a long backward memory span. There were several cases in the high school group of girls where the I. Q. was high and the results of the other tests were entirely satisfactory who could not give the backward memory span of six digits required at the sixteen-year level of the Binet. It was the large number of these cases which called attention to the fact that many more factors than have yet been analyzed out are evidently involved in the ability to do this test, and that until it has been studied further, too much weight should not be given it in making a diagnosis.

Performance Tests.

Performance tests are important not only because they test, as we believe, intelligence and mechanical skill, but also because they cause the subject to perform and we are thus enabled to study carefully a sample of his behavior under controlled laboratory conditions. By analyzing his behavior we are able to make a rating of

his comprehension, rate of movement, coördination, planfulness and all of the other items included in the analytic diagnosis.

The Witmer cylinders are a satisfactory test for this age level, but do not present as difficult a problem of the Dearborn Formboard. With the cylinders there are a number of children in this age group who solve the problem involved almost at once and the performance which is observed can be said to be composed more of an exhibition of mechanical skill (largely rate of motor response and coördination) than an exhibition of the exercise of the intelligence and all of the factors making up the analytic diagnosis. Of course, in these cases the comprehension and intelligence can easily be rated as very high by reason of the quick understanding and solution of the problem.

With the Dearborn Formboard the problem is one step more complicated. In the cylinders the spaces are there waiting for the blocks to be placed. In the Dearborn, on the other hand, when the blocks are laid on the table for the subject to replace them in the board the blocks represent halves of the geometrical figures divided longitudinally, while the spaces left vacant in the board represent halves of the figures divided transversely. Thus the spaces left vacant in the board have to be reconstructed before the blocks can be replaced. This additional element of complexity adds considerably to the value of this formboard as an intelligence test for children of this age level.

One of the interesting things to anticipate is whether the individual's discrimination of form and his observation will be sufficiently good to enable him not to confuse the hexagon and the diamond in the Dearborn Formboard as is done in such a large number of cases. This seems to be a very difficult bit of discrimination. Another observation which is valuable in rating the individual is his method of attacking the problem; whether he uses trial and error, simply moving the blocks around from one position to another until they can all be fitted in somewhere or whether he studies the situation carefully and follows a plan of action which he formulates for the solution. The time rating alone gives no indication as to the method. It is possible, and is in fact often the case, that the trial and error method, which must be considered an inferior method, can solve the tests more quickly than a well-planned system for solution. The reaction time of the individual figures in this. An individual who moves rapidly can make several incorrect moves, correct them and find the correct move, while an individual of slow reaction time but precision of thought and movement will not yet have completed the same move.

These performance tests are invaluable for making diagnoses for

vocational guidance, as they enable the examiner to observe and analyze so many of the analytic elements of personality needed for giving direction and advice.

Arithmetic.

The problems which were selected as an Arithmetic Test proved fairly satisfactory. They gave some measure of the child's ability to handle the four fundamental operations of arithmetic. A better test could, no doubt, have been devised. The main reason for making this test was that all existing tests which were examined and considered as possibilities consumed too much time in the giving Experience has indicated, however, that it would probably be advisable to have, in addition to a test of the simple arithmetical processes, some indication of the individual's ability to use these processes in problems requiring reasoning. In making such a survey again the writer would add to the examples given, problems involving reasoning, before the application of straight arithmetical principles. As it seems desirable to shorten the test, two alternatives appear: first, to make each problem shorter; or second, to give only one problem involving each operation.

The degree of inaccuracy, even among high school students, is amazing. Fifty per cent correct is looked upon as a satisfactory score for a high school student. Only fourteen high school girls and sixteen high school boys got the whole eight correct. The distribution of cases where a score of 6, 7 or 8 was made is visibly more in the high school group than in either of the other two groups. This may indicate one of two things: either the more accurate child is the one who remains in school, or they have been made more efficient by the additional school training. An investigation of the reasons why children leave school has led me to prefer the former alternative. Success in this test may indicate an innate ability to handle figures, an accuracy of mental processes or a high degree of efficiency training. For general purposes, it is not important to know which of these is being measured. No matter whether the child makes a perfect score on the test because of his ability to handle figures, his careful and precise manner of thinking and attacking problems, or because of his efficiency training, the world will judge him by the objective results. Either he does or does not do these examples correctly. For the purpose of a psychological diagnosis, it is important to know on what basis the problems are completed and it is extremely difficult sometimes to determine. The time consumed may be a clue to this. The child with a specific ability for figures is the one who will do the test most quickly. The efficiently trained individual will probably

run in second place, and will closely approximate the first, while the child whose correct results are due merely to extreme care and precision will be apt to be considerably slower than the other two. One thing which was not considered in the grading of these tests, but which is an important factor, and which should probably not be overlooked, is the number and kind of errors made in each individual problem. Two children may get the same score of, say for example, 6, but the errors which have caused one's problems to be marked wrong may be gross and ridiculous, while the errors which have caused the other child to miss two problems may be very trifling—a mere matter of one plus or minus in a figure in the problem. In a more detailed study, and for purposes of individual diagnosis, a consideration of the type and number of errors is important, but again, the objective standard of the world can be applied to these children.

Reading.

A reading test would seem to be of vital importance in testing the school proficiency of a child, since so much of the material presented in the school curriculum must be read and comprehended. The more quickly and accurately the child can read, the better his chance of success.

One difficulty is the system of scoring. The Rate Score is a helpful scale representing, as it does, the number of words per minute which a child is able to read. This gives us some idea of how many words a child of a certain age and school training should be able to cover in a certain amount of time. The Comprehension Score, however, is not so helpful. This represents a purely arbitrary score. It has no relation, so far as the author has been able to determine, to the Rate Score. It would seem logical that the Comprehension Score should be the proportion of material covered which was correctly comprehended and that it should be, in this case, expressed as a percentage of the Rate Score, or by some system of evaluating the comprehension of the ideas contained, in their relation to the speed with which the words are read. Instead of this, the Comprehension Score is a summation of individual values placed on the separate paragraphs which make up the test. The paragraphs are not well evaluated. The "oil-milk" and "air-rain" comprehension, worth only 2 and 3 respectively, are much harder than the last two, worth 4 and 5 respectively.

When you get a final score of twenty-five, for example, with a Rate of 133, you merely know that the Comprehension Score is not the perfect score which should be made with that rate. But this may be due to several factors. Your child may have skipped one or

more of the paragraphs, either reading them and failing to write the answer, or omitting the reading of them entirely. His final rate is taken as the place which he has reached, regardless of mistakes or errors, at the end of five minutes. When the Comprehension Score is added up, the paragraphs which he has skipped, of course, are subtracted from his total Comprehension Score. Another child might have answered these same questions incorrectly, so that you cannot say that a Rate Score of 133, with a Comprehension Score of 25, represents anywhere nearly the same thing in two different cases. The comprehension in the case of the child who skipped the reading entirely might be perfect, or very nearly so, while in the case of the child who had read them and failed to comprehend them, the comprehension would be given a lower rating.

The same general tendency is shown with the Monroe Silent Reading as with the Arithmetic Test, that is that the child who does well in the general psychological tests, *especially the Binet*, is apt to do well in the Monroe Silent Reading Test. No mathematical correlation has been worked out, but an inspection of results leads the author to the conclusion that there is a definite correlation between the ability to make a high I. Q., and to make a good score on the Monroe Silent Reading. In no case did a child who tested low on the general psychological tests make a brilliant score on the Monroe Silent Reading; especially was it noted that although the reading might be fair, the comprehension was almost invariably very low. A low comprehension score was a frequent occurrence with a low Binet I Q. The impressions gained from giving the Monroe Silent Reading, scoring as a diagnostic test as well as a test of school proficiency, are that it tests something of the same intellectual ability which is required to make a good I. Q. This ability is probably specific language ability.

There is a marked difference between the results of the two working groups and the results of the high school group on this test. Twenty per cent of the working group make a rate score of 120 or more, while sixty per cent of the high school group score 126 or more in Rate. This means that sixty per cent of the High School group make a comprehension score of 32 or better, while only twenty per cent of the first group make a comprehension score of more than 30.

Hard Directions Test.

The Woodworth and Wells Hard Directions Test marks off the high school group more sharply than perhaps any other tests included in the battery. No high school boy or girl made a score of less than 14 out of the possible 20 on this test, while the boys and girls of the

first two groups made scores as low as 5. There are fifty-seven boys and girls in the first group of two hundred who made less than 14 and forty-seven in the second group of two hundred who made less than 14. Twenty-five per cent of the boys and girls in the high school group made a perfect score and another twenty-five per cent made a score of 19. This test requires a high degree of the ability to quickly comprehend directions and quickly give the correct response.

Inspection of the results leads to the conclusion that there is some correlation between speed and accuracy in this test. As a rule, the children who make a score of 19 or 20 do the test in a shorter time than those who make a lower score. Good language ability and a rapid rate of reading help very much in the solution of this test, while from the point of view of the analytic diagnosis the factor which comes out most strikingly in this test is alertness. The success of the solutions depends largely on intelligence and discernment, but alertness enables the individual to realize the situation and respond quickly. As in the case of the arithmetic test, it may be that additional training secured in the grades between the sixth year and high school enables the high school children to make a better record on this test, or it may be that the more competent children go on to high school.

Certainly the ability to comprehend and follow directions accurately and quickly is an important asset in any field of work which an individual may pursue. Perhaps, as has already been stated, it is the keystone of intellectual ability. In any case, I consider this test vitally important in vocational work.

Not only do high school children have to follow directions quickly and accurately, but it is very necessary for the working boy or girl to possess this ability if he is to be successful at his work.

Conclusions.

1. Too much time is required to give the battery of tests selected, although every effort was made to cut it down to the minimum and great efficiency was developed by the examiners in the course of the experiment. The battery still leaves much to be desired in the way of fine qualitative differentiations. Although it sorts out the various mental levels in a general way, there is need for greater discrimination between the various members of a group. It would be helpful to add tests of specific abilities, as they are necessary for vocational guidance work. A better reading and arithmetic test must be secured and some quick and expeditious way should be found to secure the school standing of the pupils tested.

2. The results already obtained indicate that many more cases are needed with each test to establish authentic norms and comparative standards. It will be interesting to see how the norms change by the addition of hundreds of new cases. An investigation is being conducted at the present time which indicates that there will be little difference in the norms for the one hundred high school girls and the four hundred obtained by adding these one hundred to three hundred new cases.

3. The "job-hunting" children, Group 1, and the "job-holding" children, Group 11, appear to be essentially one and the same group. The children of the first group occupy the lower half of the distribution of results for the two groups taken together. While these two groups give evidence of being one big group with the upper and lower end indicated by the first and second group, respectively, there is a marked qualitative difference between this composite working group and the high school group. The difference in results between the working group and the high school group is striking and uniform throughout the tests. This is shown even with tests for which school training cannot be supposed to give any special fitness.

4. The range of normal competency extends from the poorest case in the working group to the best case in the high school group. Both of these two cases are normal fifteen-year-old children and so also are the many variations between these two extremes.

5. The results show that the boys do better than the girls, especially in the high school group.

6. The high school group is easily to be differentiated by the superior competency of the group from the two groups of working boys and girls, but it is surprising what poor scores are made in nearly every test by at least a few high school pupils. The mental level of high school normality extends much lower on the scale of general competency than has hitherto been considered possible.

7. Looking at the results with reference to their value in vocational guidance, this investigation discloses four distinct types of children, in conformity to which every child tested may be definitely classified. There are:

(1) The superior children who do well in both the performance tests and the intellectual tests (*i. e.*, the Hard Directions, Arithmetic, Reading and Binet tests).

(2) The children who do poorly in both the performance tests and in the intellectual tests.

(3) The children who do well in the intellectual tests, but make indifferent or even poor records in the performance tests, and

(4) The children who give excellent, sometimes even remarkable, exhibitions in the performance tests and yet do very badly with the intellectual tests.

Children of the first type, the superior children of general competency, may be expected to adjust themselves in any environment and to succeed at almost anything that they may attempt.

The children of the second type are inferior children in both intellectual and mechanical competency. To give them vocational guidance it would be necessary to discover some special ability which an ordinary battery of psychological tests cannot be expected to discover, or else they must be recommended to secure training in efficiency at some occupation requiring only a low level of mentality or skill.

Children of the third type have a fairly high intellectual level, but the performance tests disclose either deficiency of intelligence in the sense of the ability to solve what for the individual is a new problem, or a deficiency in mechanical skill, the ability to work expeditiously with concrete material. Shall we advise a child of the third type to continue his school work and seek some intellectual field of activity? If the deficiency in performance is a deficiency of intelligence, surely not, but if it is a deficiency in mechanical skill a child of this group may be expected to succeed at some profession requiring originality in intellectual operations. If, on the other hand, the deficiency in the performance tests is taken to indicate a lack of intelligence, then the child ought not to be advised to push on in school work. If he does, he will join the ranks of those who have been over-educated beyond their performance ability. They pass examinations and acquire knowledge, but are unable to use their acquired knowledge successfully in any occupation of high intellectual level. They disappoint their instructors and themselves. They join the ranks of failures in the intellectual occupations.

The children who conform to type 4 are not intellectual, but are either intelligent or skilful in mechanical operations. They should be made ready quickly, with a minimum of efficiency training, to take their place in the world in order that they may pit their intelligence and skill against the intelligence and skill of competitors in some productive field.

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Note

The Table of Norms, appearing on the next following pages, begins the issue of a series of standard tables, to be called The Witmer Diagnostic Standards, which will be continued, augmented and amended as the occasion offers.

Table of Norms—Fifteen-Year Level

Group I. The "job hunters"—130 boys, 70 girls.

Group II. The "job holders"—100 boys, 100 girls.

Group III. A High School group—100 boys, 100 girls.

Group IV. Another High School group—300 girls.

Group V. A combined group—400 girls, Group IV, and girls of Group III.

Note 1.—Those who did not complete a test with a time limit are recorded as failures. The number of such failures is entered in the table following the highest score made within the time limit. For example, 234+2 means that there were two failures to complete the test in the time limit of three hundred seconds.

Note 2.—Twenty cases, eliminated from the table because of excessive scatter, are reported at the end of the table.

1. Height (inches).

	Boys.					Girls.				
	Min.	20%	Med.	80%	Max.	Min.	20%	Med.	80%	Max.
Group I.	53	61	63	67	70	51	61	63	64	67
Group II.	54	62	64	67	74	50	60	63	65	72
Group III.	50	58	62	66	72	50	60	62	64	69
Group IV.	..	..	..	..	..	54	60	62	64	68
Group V.	..	..	..	..	..	50	60	62	64	69

2. Weight (pounds).

Group I.	72	97	112	127	178	80	95	110	121	153
Group II.	80	100	115	130	178	74	98	109	117	138
Group III.	79	90	108	128	170	69	97	106	120	168
Group IV.	..	..	..	..	..	79	95	106	120	165
Group V.	..	..	..	..	..	69	96	105	120	168

3. Age (years, months).

Group I.	14—0	14—10	15—8	16—0	21—0	14—0	14—9	15—5	16—6	19—2
Group II.	14—1	15—2	15—7	15—10	16—6	14—1	14—8	15—2	15—6	16—0
Group III.	12—4	14—0	14—10	15—8	16—2	13—2	14—1	14—9	15—5	16—3
Group IV.	..	..	..	..	..	12—2	13—11	14—7	15—6	18—5
Group V.	..	..	..	..	..	12—2	14—00	14—8	15—6	18—5

4. Intelligence Quotient.

Group I.	50	71	88	103	117	54	69	81	100	116
Group II.	60	79	95	105	119	54	79	93	107	121
Group III.	82	107	116	125	147	71	97	108	119	143
Group IV.	..	..	..	..	..	69	91	101	114	141
Group V.	..	..	..	..	..	69	92	103	115	143

5 Mental Age.

Group I.	8—0	11—3	13—10	16—0	17—6	8—6	10—6	12—8	15—2	17—6
Group II.	9—6	12—4	14—8	16—0	17—6	8—9	12—1	14—0	16—0	17—6
Group III.	13—0	15—10	17—4	18—3	19—0	11—2	14—7	16—0	17—4	19—0
Group IV.	..	..	..	..	..	10—7	13—6	14—9	16—1	18—3
Group V.	..	..	..	..	..	10—7	13—7	15—3	16—9	19—0

6. Memory Span (Auditory Digits).

Group I.	5	6	7	8	10	5	6	7	8	9
Group II.	5	6	7	8	10	5	6	7	8	10
Group III.	6	7	8	9	10	5	7	8	9	10
Group IV.	..	..	..	..	..	6	7	8	9	10
Group IV.	..	..	..	..	..	5	6	7	8	10

Table of Norms—Fifteen-Year Level—*Continued.*

7. Memory Span (Visual Digits).

	Boys.					Girls.				
	Min.	20%	Med.	80%	Max.	Min.	20%	Med.	80%	Max.
Group I.....	5	7	8	9	10	5	7	7	9	10
Group II.....	5	7	8	9	10	6	7	8	9	10
Group III....	6	7	8	9	10	6	7	8	9	10
Group IV.....	..	..	..	..	..	6	7	8	9	10
Group V.....	..	..	..	..	..	6	7	8	9	10

8. Cylinders (First Trial, seconds).

Group I.....	22	44	60	83	236+[3]	22	49	70	104	228+[1]
Group II.....	32	43	55	73	158	30	50	66	94	287
Group III....	23	39	51	67	178	25	47	58	76	172+[1]
Group IV.....	..	..	..	..	..	35	57	76	103	234+[1]
Group V.....	..	..	..	..	..	25	53	71	98	234+[3]

9. Cylinders (Second Trial, seconds).

Group I.....	20	35	45	59	174	23	37	50	65	125
Group II.....	22	35	43	55	115	18	39	46	60	83+[1]
Group III....	25	35	43	51	73	23	38	49	59	104
Group IV.....	..	..	..	..	..	25	45	55	73	130
Group V.....	..	..	..	..	..	23	42	53	70	130

10. Dearborn (First Trial, seconds).

Group I.....	45	85	160	320	510+[5]	43	133	228	440	562+[3]
Group II.....	24	63	118	579	579+[3]	36	105	157	270	532+[3]
Group III....	42	70	122	220	495+[1]	43	73	166	251	420+[3]
Group IV.....	..	..	..	..	..	53	100	180	320	580+[12]
Group V.....	..	..	..	..	..	43	94	175	300	580+[14]

11. Dearborn (Second Trial, seconds).

Group I.....	20	45	77	127	442	33	75	110	197	322+2
Group II.....	26	38	63	156	315	25	49	70	147	399
Group III....	20	40	55	105	190	24	40	70	120	395
Group IV.....	..	..	..	..	..	32	65	107	203	555+[5]
Group V.....	..	..	..	..	..	24	57	97	180	555+[6]

12. Arithmetic (Score).

Group I.....	0	3	5	7	8	0	2	4	6	8
Group II.....	0	3	5	7	8	0	3	5	7	8
Group III....	1	5	7		8	1	5	6	8	8
Group IV.....	..	..	..	..	..	1	4	6	8	8
Group V.....	..	..	..	..	..	1	4	6	7	8

13. Arithmetic (Time, seconds).

Group I.....	210	320	415	716	1244	146	330	472	641	1081+[1]
Group II.....	219	311	423	578	1131	256	345	427	655	1287
Group III....	126	206	280	364	670	125	264	345	466	684
Group IV.....	..	..	..	..	..	115	258	320	415	920
Group V.....	..	..	..	..	..	115	260	325	424	920

Table of Norms—Fifteen-Year Level—*Continued.*

14. Reading (Rate).

	Boys.					Girls.				
	Min.	20%	Med.	80%	Max.	Min.	20%	Med.	80%	Max.
Group I.....	27	69	98	146	146	31	54	81	119	146
Group II.....	31	69	119	146	146	43	69	108	146	146
Group III.....	69	108	146	146	146	54	98	133	146	146
Group IV.....	..	..	..	..	..	54	98	133	146	146
Group V.....	..	..	..	..	..	54	98	133	146	146

15. Reading (Comprehension).

Group I.....	4	13	21	33	45	4	13	18	25	45
Group II.....	5	13	21	30	45	5	15	22	33	45
Group III.....	16	25	37	42	45	14	24	32	40	45
Group IV.....	..	..	..	..	..	13	21	31	39	45
Group V.....	..	..	..	..	..	13	21	31	40	45

16. Hard Directions (Score).

Group I.....	5	12	16	18	20	6	12	16	18	20
Group II.....	7	13	16	19	20	9	14	17	18	20
Group III.....	14	17	19	20	20	14	17	18	20	20
Group IV.....	..	..	..	..	..	13	17	18	20	20
Group V.....	..	..	..	..	..	13	17	18	20	20

17. Hard Directions (Time, seconds).

Group I.....	88	197	300	380	1120	128	205	280	340	962
Group II.....	74	206	295	385	689	115	189	250	344	898
Group III.....	82	131	174	218	345	65	150	200	258	600
Group IV.....	..	..	..	..	..	95	151	195	242	666
Group V.....	..	..	..	..	..	65	150	195	245	666

ELIMINATIONS.

6. Memory Span (Auditory).
   I. B. 4
   II. B. 4

7. Memory Span (Visual).
   I. B. 4
   II. B. 4

9. Cylinders (Second Trial).
   IV. G. 200–208

11. Dearborn (Second Trial).
    III. B. 300

14. Reading (Rate).
    III. G. 27–43

15. Comprehension.
    I. B. 0–2 G. 2–2
    II. B. 7–10 G. 2–2

17. Hard Directions (Score).
    I. B. 0–0
    II. B. 3–5 G. 6